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DIRECTIONS

FOR TAKING

METEOROLOGICAL OBSERVATIONS;

ADOPTED BY THE

MEDICAL DEPARTMENT

OF THE

UNITED STATES ARMY.

1844.

VC
U54d
1944

The following 'Directions for taking Meteorological Observations' are published for the use of the officers of the Medical Staff; and it is expected that they will be observed, in all respects, with the utmost strictness and regularity.

The senior medical officer on duty at each military station will be held officially responsible for the accuracy of the Meteorological Observations made at the station, and his signature will be appended to each Register.

At the close of each month, within the period (five days) prescribed for the completion of other official documents, a fair copy of the Meteorological Register (form No. 3) will be transmitted, under cover, addressed *directly* to the Surgeon General.

The Hourly Meteorological Register (form No. 4) kept on the 21st of March, June, September, and December, will be forwarded at the same time, and under the same cover with the daily Register, at the end of each of these months.

TH. LAWSON,

Surgeon General.

Surgeon General's Office,
July 1st, 1844.

DIRECTIONS

FOR TAKING METEOROLOGICAL OBSERVATIONS.

Observations of the Barometer, with its Attached Thermometer, of the Thermometer (Detached), the Clearness of the Sky, the Direction and Force of the Wind, and the Direction and Velocity of the Clouds, will be made at a little before sunrise,* 9 A. M., 3 P. M., and 9 P. M.

Observations of the Wet-bulb Thermometer are to be taken at a little before sunrise, and at 3 P. M.

At every fall of rain, snow, hail, or sleet, the time of its commencement and end will be recorded, and the quantity which fell, as indicated by the Rain Gauge.

Each of the above observations will be registered, as soon as

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* These hours correspond with those adopted by the Royal Society of London, with the exception that a '*little before sunrise*' has been substituted for 3 A. M. They express very nearly the extremes and the means of daily temperature, and do not perhaps vary much from the periods when the extreme points of barometric oscillation happen over a large portion of the globe.

made, in its appropriate column. Should, however, an observation be from necessity omitted at any of the regular periods, it is enjoined that a blank be left on the Register in the place where the omitted observation should have been recorded.

The '*Daily Mean*' of the Thermometer (detached) is to be found by adding together the observations at sunrise and 3 P. M., and halving the sum.*

At the end of the month, add up each column of figures on the Register, under the heads of '*Barometer*,' '*Thermometer Attached*,' '*Thermometer Detached*,' '*Clearness of the Sky*,' and '*Wet-bulb*,' and divide the sum by the number of days on which observations were made. The *quotient* will be placed at the foot of each column, upon the line marked '*Monthly Mean*.'

The '*Quantity of Rain*' will also be added up, and the *sum* placed at the foot of the proper column.

In all entries on the Register, *fractions* will be expressed in *decimals*.

BAROMETER.

The instrument adopted by the Department is the syphon Barometer of Bunten.

For transportation it is inverted and placed in a leathern case,

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* It has been determined by long experience that the minimum temperature of the twenty-four hours occurs at a '*little before sunrise*,' in a vast majority of instances, and the maximum about *three* P. M., and that the mean for these two periods varies but little from the mean for the whole day.

(the *top* of the instrument being thus at the *bottom* of the case,) of which the end marked '*Haut*' must always be kept uppermost.

After drawing the instrument *gently* from its case, carefully restore it to its proper position, and hang it by the ring at its top, upon the screw hook which will be found in the compartment in the top of the case, and which must be securely fastened in a substantial upright.

The Barometer will be suspended perpendicularly, in a good light, in an apartment having an equable temperature, and a dry atmosphere.*

When once suitably placed, the position of the instrument should not be changed, unless from absolute necessity—in which case the circumstance will be carefully noted on the Register, under the head of 'Remarks.'

If the means be at hand, the *altitude* of the mercury in the lower scale of the Barometer above the *level of the sea*, should be ascertained, and stated on the Register; if not, its relative position, in regard to height, to some permanent mark in the neighborhood, should be measured. †

It will be observed that there are two scales on the Barometer.

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* The position of the Barometer in an *apartment* cannot, of course, affect its accuracy, for the pressure of the atmosphere is precisely the same in the closest room, provided that it is not absolutely *air-tight*, as under the open sky. Neither does a fire in the apartment affect the accuracy of the instrument; on the contrary it prevents it from rusting, and obviates the tendency of the mercury in the tube to oxidate; and the Barometer should never, under any circumstances, be permanently exposed to the weather.

† The height of the Barometer above the level of the sea must be known, in order that the altitudes of the various instruments in use by the department may

On the upper scale the degrees are reckoned, from the middle of the instrument, *upwards ;* and, on the lower, from the middle, *downwards.*

The larger degrees on these scales (those which are numbered) are *centimètres,* and their subdivisions (not numbered) are tenths of a *centimètre,* or *millimètres* ; thus 36 larger, and 3 smaller divisions read $36\frac{3}{10}$ *centimètres,* or, in decimals, 36.3.

Each scale is provided with a *vernier,* which can be raised, or lowered, by turning the small milled head attached to it.

Before taking an observation, *tap* the instrument *gently* with the fingers, in order to dislodge any globules of the mercury which may adhere to the glass tube.

TO TAKE A BAROMETRICAL OBSERVATION.

Looking at the upper scale, bring the lower edge of the vernier (marked 0) to a level with the surface of the mercury in the glass tube.

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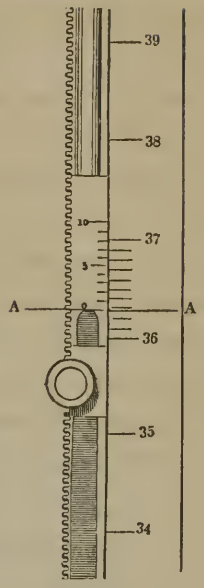
be reduced to a common level; otherwise, it would be impossible to compare them with each other, or to embody their consolidated results in a tabular form.

A sextant, or a theodolite, is necessary to determine the altitude above the level of the sea. Where these instruments cannot be had, a simple water or spirit level, with a surveyor's rod, would suffice to measure the difference of height between the position of the Barometer and some permanent object of known altitude in the vicinity of a post, such as ordinary low water mark in a neighboring river or lake, &c. &c.

Suppose the line AA in the diagram to represent the lower edge of the vernier in this position, the reading would be 36.2, with a slight excess. To ascertain the amount of this excess, run the eye up the scale on the vernier from zero, (0,) until one of its degrees is found coinciding exactly with a degree on the larger scale. The degree thus found on the vernier (in the present instance 7) is to be annexed to the former reading, 36.2, thus: 36.27—(thirty-six *centimètres* and twenty-seven hundredths of a *centimètre*)—which expresses exactly the height of the mercury in the upper scale.

UPPER SCALE.

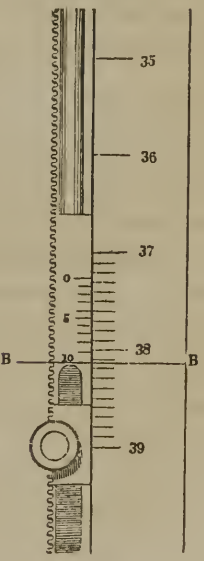


Pass to the lower scale, remembering that the degrees now count downwards.

Bring, as before, the lower edge of the vernier (marked 10) to a level with the convex surface of the mercury, as represented by the line BB.

The scale reads 38.1, and a fraction over. On the vernier, counting downwards from zero, (0,) the fourth degree coincides with a degree on the larger scale. Accordingly, 4 annexed to 38.1, thus: 38.14, expresses the height of the mercury in the lower scale.

LOWER SCALE.



To complete the observation, add the readings of the two scales together:—

36.27
38.14

74.41

The sum 74.41 expresses the height of the barometric column, in *centimètres* and hundredths of a *centimètre*. This will be sought for in the '*Table for converting the French Barometer Scale into the English*,' in its proper column, under the head '*Centimètres*,' and corresponding with it in the next column to the right, under the head '*English Inches*,' will be found its value in inches and thousandths of an inch.

In the present instance, 74.41 *centimètres* will be found equal to 29.295 inches; and 29.295 will be, accordingly, set down in the Register.

THERMOMETER (ATTACHED.)

At the time of observing the Barometer, observe also the height, to the half of a degree, of the centigrade Thermometer attached to it. Refer the observation—say for example, in this instance, 12.5—to the proper column in the '*Table for reducing Degrees of the Centigrade Thermometer to Degrees of Fahrenheit*,' under the head '*Centigrade*,' and in the next column to the right, under the head '*Fahrenheit*,' will be found its corresponding degree of Fahrenheit's

scale, viz: 54.5, which will be registered, accordingly, as the observation of the attached Thermometer.

THERMOMETER (DETACHED.)

The Thermometer will be placed in a situation having a free circulation of air, not exposed to the direct or reflected rays of the sun, and sheltered from rain. Its situation should be remote from massy walls, which slowly imbibe or part with caloric. In making observations avoid breathing on the instrument, or touching it; and at night manage your lamp so as not to cause a rise of the mercury by its heat.

CLEARNESS OF THE SKY.

The amount of clear sky, at the hours of observation, will be designated by the figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; 0 signifying no clear sky; 1, a very small portion of clear sky; and so on to 10, which indicates the entire absence of clouds, or haze.

WIND.

The direction and estimated force of the wind will be registered together.

The direction will be expressed, as is customary, by the letters which denote the points of the compass, as W., S.W., S.S.W., &c. The force of the wind will be expressed by figures from 0 to 10, thus :

0 will signify a calm ;
1 „ „ a barely perceptible breeze ;
2 „ „ a gentle breeze ;
3 „ „ a moderate breeze ;
4 „ „ a brisk breeze ;
5 „ „ a strong wind ;
6 „ „ a very strong wind ;
7 „ „ a storm ;
8 „ „ a great storm ;
9 „ „ a hurricane ;
10 „ „ a violent hurricane.

For example :—should the wind blow a brisk breeze from W.S.W., the expression in the Register would be W.S.W. 4.

CLOUDS.

As several strata or currents of clouds often exist at different heights, the direction and velocity of motion of the *lowest stratum only* will be registered under the head of clouds, using the same expressions as in registering the wind. Thus, should the clouds move briskly from the S.W. the expression would be S.W. 4, the letters denoting the direction, and the figure the velocity of the motion.

WET-BULB.

The hygrometric condition of the atmosphere may be indirectly determined by ascertaining the degree of refrigeration produced by the evaporation of water in the open air. The most easy method of finding this is to wet the bulb of a Thermometer covered round with fine gauze, and swing the instrument in the open air, in the shade, until the mercury sinks as low as it will.

The current of air upon the wet-bulb should be kept up (by swinging) as long as the mercury continues to descend in the tube of the instrument, and for a few minutes after it becomes stationary, in order to ensure the full effect of the evaporation,* and the lowest degree to which the mercury can be forced to descend by this process, will constitute the observation required, and, as such, it will be recorded on the Register, in the column headed ' Wet-Bulb.'

The water used to wet the bulb of the Thermometer should be

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* When the temperature of the air is above the freezing point, a few minutes will suffice to produce all the reduction of temperature in the mercury that evaporation can effect; but, when the air is below the freezing point, a longer time will be necessary. A *thin film of ice* should then be allowed to form around the bulb, (the thinner the better,) and the swinging should be continued until the evaporation from the surface of this film of ice shall have lowered the mercury in the tube to a point below the temperature of the air, where it becomes stationary. The evaporation from ice is slower than that from water, and as the temperature of the air descends, there is a point (which has not yet been accurately determined) where it ceases entirely; still, when it takes place, it is always in inverse proportion to the quantity of moisture in the atmosphere, and it is the only means that science has as yet pointed out of ascertaining the dew point indirectly.

as nearly as possible at the same temperature as the air, at the time of taking the observation. It should not be poured upon the bulb of the Thermometer, but applied with a bit of sponge, a fine brush, or any similar substance, and when the temperature is near, or below the freezing point, care should be taken simply to *moisten* the gauze.

RAIN.

The instrument used to measure the quantity of rain which falls is the conical Rain Gauge.*

It will be kept remote from all elevated structures at a distance at least equal to their height, and still farther off, where it can be

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From the wet-bulb observation and the temperature of the air, the dew point may be calculated by the following simple rule: Divide 103 by the wet-bulb, and let the quotient be multiplied by the difference of the temperature of the air and the wet bulb; subtract this product from the temperature of the air, and the result is the dew point; thus:—Suppose the temperature of the air to be 80° and the wet-bulb observation at the same hour to be 72°, then

$\frac{103}{72}=1.43.$

$1.43\times(80-72)=11.44$, and

$80-11.44=68.56$ i. e. the dew point.

The dew point is the highest degree of temperature at which dew begins to form, and is indicated by the first deposit of aqueous vapor from the atmosphere on a bright metallic, or a glass surface.

* A description of this instrument, and the principles upon which it is constructed, is given in Silliman's American Journal of Science and Arts, for April, May, and June, 1832.

conveniently done. It is to be suspended in a circular opening made in a board, which is to be fixed to a post, eight feet from the ground; the opening to be five inches in diameter, and beveled so as to fit the side of the gauge, into which the cap is to be fixed, base downwards, to prevent evaporation. The measurement is made by putting down perpendicularly to the bottom of the gauge the measuring stick, and applying it, from its point to the water mark, on the scale, which will express the quantity in inches, or their decimals. The graduation of the scale is by hundredths of an inch for the first three tenths of an inch, and above that by tenths and half tenths. Parts of degrees will be measured by the eye, and set down in decimals. If a rain continue for any length of time, the quantity in the gauge will be measured at suitable intervals, before the water rises high in it, and the measurements summed up at the close.

In freezing weather, when the Rain Gauge cannot be used out of doors, it will be taken into the room, and a tin vessel will be substituted for receiving the snow, rain, or sleet, that may then fall. This vessel must have its opening exactly equal to that of the Rain Gauge, and widen downwards to a sufficient depth with a considerable slope. It should be placed where nothing can obstruct the descending snow from entering, and where no drift snow can be blown into it. During a continued snow storm, the snow may be occasionally pressed down. The contents of the vessel must be melted by placing it near the fire, with a cover to prevent evaporation, and the water produced poured into the gauge to ascertain its quantity, which must then be entered on the Register.

REMARKS.

Under this head may be noted all remarkable phenomena, especially sudden and simultaneous* changes of wind and temperature ; their effect on the Barometer; the moment of greatest depression of the Barometer in the passage of storms ; currents of clouds moving in different directions, and at different heights ; the rise and fall of rivers and lakes ; remarkable tides ; the opening and closing of navigable waters; the last killing frost that occurs in spring, and the first in autumn, as shown by their effects on the tender buds, leaves, and germs of fruit trees, &c ; the commencement and progress of vegetation ; the first appearance and departure of birds of passage ; thunder storms, near or remote ; silent lightning, with its direction and elevation above the horizon ; falls of hail, snow, and sleet ; fogs ; white or hoar frost, &c.

Always examine the heavens at the latest observation, whether there be any Aurora, or shooting stars ; and especially about the 10th of August, and 12th and 13th of November, see whether there be any great number of luminous meteors visible, stating the number observed in an hour, or at least in a quarter of an hour. In case of great fires occurring in clear, calm, dry weather, with a high dew point, observe whether clouds form over the fire, and describe the phenomena.

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* All atmospheric vicissitudes which seem to affect invalids unfavorably or otherwise, and the supposed agency of climate in the causation and cure of disease, will be noticed in the Quarterly Report of Sick. (Form 8.)

SPECIAL OBSERVATIONS.

Hourly Observations of the Baromcter will be taken for 24 hours, at the equinoxes and solstices, to correspond with those already instituted at numerous points of Europe and America, at the suggestion of Sir John Herschel. The days fixed upon for these observations are the 21st of March, June, September, and December. But should any one of these 21st days fall on Sunday, then the observations will be deferred till the next day, the 22nd.

The observations at each station will commence at 6 o'clock, A. M. of the appointed days, and be continued at the beginning of each hour till 6 A. M. of the following days, care being taken to obtain the correct time.

The exact maximum and minimum of temperature of the 24 hours should be recorded, under the head of 'Remarks,' at the precise hour and minute at which they occur.

The value of these hourly observations will be greatly enhanced, if they be extended to all the objects embraced in the daily Register. If there be a storm about those times, hourly observations of all the phenomena, from the beginning to the end of the storm, will also be valuable.

All special observations will be recorded separately.

Connected with meteorology are many interesting subjects of inquiry, which can only be elucidated by wide-spread, simultaneous observations. The Medical Officers of the Army are therefore confidently invited to co-operate in the collection of data tend-

ing to advance the interests of science. For the accuracy of our observations, (quoted as they will be both at home and abroad,) it is hardly necessary to say, the reputation of the Department is pledged.

TABLE

FOR CONVERTING THE FRENCH BAROMETER SCALE INTO THE ENGLISH.

1 *French Mètre*=39.371 *English Inches.*

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
70.00	27.559	70.13	27.610	70.26	27.662	70.39	27.713
.01	.563	.14	.614	.27	.666	.40	.717
.02	.567	.15	.618	.28	.669	.41	.721
.03	.571	.16	.622	.29	.673	.42	.725
.04	.575	.17	.626	.30	.677	.43	.728
.05	.579	.18	.630	.31	.681	.44	.732
.06	.583	.19	.634	.32	.685	.45	.736
.07	.587	.20	.638	.33	.689	.46	.740
.08	.591	.21	.642	.34	.693	.47	.744
.09	.595	.22	.646	.35	.697	.48	.748
.10	.599	.23	.650	.36	.701	.49	.752
.11	.603	.24	.654	.37	.705	.50	.756
.12	.606	.25	.658	.38	.709	.51	.760

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
70.51	27.760	70.75	27.855	70.99	27.949	71.23	28.043
.52	.764	.76	.859	71.00	.953	.24	.047
.53	.768	.77	.862	.01	.957	.25	.051
.54	.772	.78	.866	.02	.961	.26	.055
.55	.776	.79	.870	.03	.965	.27	.059
.56	.780	.80	.874	.04	.969	.28	.063
.57	.784	.81	.878	.05	.973	.29	.067
.58	.788	.82	.882	.06	.977	.30	.071
.59	.791	.83	.886	.07	.980	.31	.075
.60	.795	.84	.890	.08	.984	.32	.079
.61	.799	.85	.894	.09	.988	.33	.083
.62	.803	.86	.898	.10	.992	.34	.087
.63	.807	.87	.902	.11	.996	.35	.091
.64	.811	.88	.906	.12	28.000	.36	.095
.65	.815	.89	.910	.13	.004	.37	.099
.66	.819	.90	.914	.14	.008	.38	.103
.67	.823	.91	.918	.15	.012	.39	.106
.68	.827	.92	.921	.16	.016	.40	.110
.69	.831	.93	.925	.17	.020	.41	.114
.70	.835	.94	.929	.18	.024	.42	.118
.71	.839	.95	.933	.19	.028	.43	.122
.72	.843	.96	.937	.20	.032	.44	.126
.73	.847	.97	.941	.21	.036	.45	.130
.74	.851	.98	.945	.22	.040	.46	.134

Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.
71.47	28.138	71.71	28.232	71.95	28.327	72.19	28.421
.48	.142	.72	.236	.96	.331	.20	.425
.49	.146	.73	.240	.97	.335	.21	.429
.50	.150	.74	.244	.98	.339	.22	.433
.51	.154	.75	.248	.99	.343	.23	.437
.52	.158	.76	.252	72.00	.347	.24	.441
.53	.162	.77	.256	.01	.351	.25	.445
.54	.166	.78	.260	.02	.354	.26	.449
.55	.169	.79	.264	.03	.358	.27	.453
.56	.173	.80	.268	.04	.362	.28	.457
.57	.177	.81	.272	.05	.366	.29	.461
.58	.181	.82	.276	.06	.370	.30	.465
.59	.185	.83	.280	.07	.374	.31	.469
.60	.189	.84	.284	.08	.378	.32	.473
.61	.193	.85	.288	.09	.382	.33	.477
.62	.197	.86	.292	.10	.386	.34	.480
.63	.201	.87	.295	.11	.390	.35	.484
.64	.205	.88	.299	.12	.394	.36	.488
.65	.209	.89	.303	.13	.398	.37	.492
.66	.213	.90	.307	.14	.402	.38	.496
.67	.217	.91	.311	.15	.406	.39	.500
.68	.221	.92	.315	.16	.410	.40	.504
.69	.225	.93	.319	.17	.414	.41	.508
.70	.229	.94	.323	.18	.417	.42	.512

Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.
72.43	28.516	72.67	28.610	72.91	28.705	73.15	28.799
.44	.520	.68	.614	.92	.709	.16	.803
.45	.524	.69	.618	.93	.713	.17	.807
.46	.528	.70	.622	.94	.717	.18	.811
.47	.532	.71	.626	.95	.721	.19	.815
.48	.536	.72	.630	.96	.725	.20	.819
.49	.540	.73	.634	.97	.729	.21	.823
.50	.543	.74	.638	.98	.732	.22	.827
.51	.547	.75	.642	.99	.736	.23	.831
.52	.551	.76	.646	73.00	.740	.24	.835
.53	.555	.77	.650	.01	.744	.25	.839
.54	.559	.78	.654	.02	.748	.26	.843
.55	.563	.79	.658	.03	.752	.27	.847
.56	.567	.80	.662	.04	.756	.28	.851
.57	.571	.81	.666	.05	.760	.29	.855
.58	.575	.82	.669	.06	.764	.30	.858
.59	.579	.83	.673	.07	.768	.31	.862
.60	.583	.84	.677	.08	.772	.32	.866
.61	.587	.85	.681	.09	.776	.33	.870
.62	.591	.86	.685	.10	.780	.34	.874
.63	.595	.87	.689	.11	.784	.35	.878
.64	.599	.88	.693	.12	.788	.36	.882
.65	.603	.89	.697	.13	.792	.37	.886
.66	.606	.90	.701	.14	.795	.38	.890

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
73.39	28.894	73.63	28.988	73.87	29.083	74.11	29.177
.40	.898	.64	.992	.88	.087	.12	.181
.41	.902	.65	.996	.89	.091	.13	.185
.42	.906	.66	29.000	.90	.095	.14	.189
.43	.910	.67	.004	.91	.099	.15	.193
.44	.914	.68	.008	.92	.103	.16	.197
.45	.917	.69	.012	.93	.106	.17	.201
.46	.921	.70	.016	94	.110	.18	.205
.47	.925	.71	.020	.95	.114	.19	.209
.48	.929	.72	.024	.96	.118	.20	.213
.49	.933	.73	.028	.97	.122	.21	.217
.50	.937	.74	.032	.98	.126	.22	.221
.51	.941	.75	.036	.99	.130	.23	.225
.52	.945	.76	.040	74.00	.134	.24	.229
.53	.949	.77	.043	.01	.138	.25	.232
.54	.953	.78	.047	.02	.142	.26	.236
.55	.957	.79	.051	.03	.146	.27	.240
.56	.961	.80	.055	.04	.150	.28	.244
.57	.965	.81	.059	.05	.154	.29	.248
.58	.969	.82	.063	.06	.158	.30	.252
.59	.973	.83	.067	.07	.162	.31	.256
.60	.977	.84	.071	.08	.166	.32	.260
.61	.980	.85	.075	.09	.169	.33	.264
.62	.984	.86	.079	.10	.173	.34	.268

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
74.35	29.272	74.59	29.366	74.83	29.461	75.07	29.555
.36	.276	.60	.370	.84	.465	.08	.559
.37	.280	.61	.374	.85	.469	.09	.563
.38	.284	.62	.378	.86	.473	.10	.567
.39	.288	.63	.382	.87	.477	.11	.571
.40	.292	.64	.386	.88	.481	.12	.575
.41	.295	.65	.390	.89	.484	.13	.579
.42	.299	.66	.394	.90	.488	.14	.583
.43	.303	.67	.398	.91	.492	.15	.587
.44	.307	.68	.402	.92	.496	.16	.591
.45	.311	.69	.406	.93	.500	.17	.595
.46	.315	.70	.410	.94	.504	.18	.599
.47	.319	.71	.414	.95	.508	.19	.603
.48	.323	.72	.418	.96	.512	.20	.606
.49	.327	.73	.421	.97	.516	.21	.610
.50	.331	.74	.425	.98	.520	.22	.614
.51	.335	.75	.429	.99	.524	.23	.618
.52	.339	.76	.433	75.00	.528	.24	.622
.53	.343	.77	.437	.01	.532	.25	.626
.54	.347	.78	.441	.02	.536	.26	.630
.55	.351	.79	.445	.03	.540	.27	.634
.56	.355	.80	.449	.04	.543	.28	.638
.57	.358	.81	.453	.05	.547	.29	.642
.58	.362	.82	.457	.06	.551	.30	.646

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
75.31	29.650	75.55	29.744	75.79	29.839	76.03	29.933
.32	.654	.56	.748	.80	.843	.04	.937
.33	.658	.57	.752	.81	.847	.05	.941
.34	.662	.58	.756	.82	.851	.06	.945
.35	.666	.59	.760	.83	.855	.07	.949
.36	.669	.60	.764	.84	.858	.08	.953
.37	.673	.61	.768	.85	.862	.09	.957
.38	.677	.62	.772	.86	.866	.10	.961
.39	.681	.63	.776	.87	.870	.11	.965
.40	.685	.64	.780	.88	.874	.12	.969
.41	.689	.65	.784	.89	.878	.13	.973
.42	.693	.66	.788	.90	.882	.14	.977
.43	.697	.67	.792	.91	.886	.15	.981
.44	.701	.68	.795	.92	.890	.16	.984
.45	.705	.69	.799	.93	.894	.17	.988
.46	.709	.70	.803	.94	.898	.18	.992
.47	.713	.71	.807	.95	.902	.19	.996
.48	.717	.72	.811	.96	.906	.20	30.000
.49	.721	.73	.815	.97	.910	.21	.004
.50	.725	.74	.819	.98	.914	.22	.008
.51	.729	.75	.823	.99	.918	.23	.012
.52	.732	.76	.827	76.00	.921	.24	.016
.53	.736	.77	.831	.01	.925	.25	.020
.54	.740	.78	.835	.02	.929	.26	.024

Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.
76.27	30.028	76.51	30.122	77.75	30.217	76.99	30.311
.28	.032	.52	.126	.76	.221	77.00	.315
.29	.036	.53	.130	.77	.225	.01	.319
.30	.040	.54	.134	.78	.229	.02	.323
.31	.044	.55	.138	.79	.233	.03	.327
.32	.048	.56	.142	.80	.236	.04	.331
.33	.051	.57	.146	.81	.240	.05	.335
.34	.055	.58	.150	.82	.244	.06	.339
.35	.059	.59	.154	.83	.248	.07	.343
.36	.063	.60	.158	.84	.252	.08	.347
.37	.067	.61	.162	.85	.256	.09	.351
.38	.071	.62	.166	.86	.260	.10	.355
.39	.075	.63	.170	.87	.264	.11	.358
.40	.079	.64	.173	.88	.268	.12	.362
.41	.083	.65	.177	.89	.272	.13	.366
.42	.087	.66	.181	.90	.276	.14	.370
.43	.091	.67	.185	.91	.280	.15	.374
.44	.095	.68	.189	.92	.284	.16	.378
.45	.099	.69	.193	.93	.288	.17	.382
.46	.103	.70	.197	.94	.292	.18	.386
.47	.107	.71	.201	.95	.295	.19	.390
.48	.110	.72	.205	.96	.299	.20	.394
.49	.114	.73	.209	.97	.303	.21	.398
.50	.118	.74	.213	.98	.307	.22	.402

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
77.23	30.406	77.47	30.500	77.71	30.595	77.95	30.689
.24	.410	.48	.504	.72	.599	.96	.693
.25	·414	.49	.508	.73	.603	.97	.697
.26	.418	.50	.512	.74	.607	.98	.701
.27	.421	.51	.516	.75	.610	.99	.705
.28	.425	.52	.520	.76	.614	78.00	.709
.29	.429	.53	.524	.77	.618	.01	.713
.30	.433	.54	.528	.78	.622	.02	.717
.31	.437	.55	.532	.79	.626	.03	.721
.32	.441	.56	.536	.80	.630	.04	.725
.33	.445	.57	.540	.81	.634	.05	.729
.34	.449	.58	.544	.82	.638	.06	.733
.35	.453	.59	.547	.83	.642	.07	.736
.36	.457	.60	.551	.84	.646	.08	.740
.37	.461	.61	.555	.85	.650	.09	.744
.38	.465	.62	.559	.86	.654	.10	.748
.39	.469	.63	.563	.87	.658	.11	.752
.40	.473	.64	.567	.88	.662	.12	.756
.41	.477	.65	.571	.89	.666	.13	.760
.42	.481	.66	.575	.90	.670	.14	.764
.43	.484	.67	.579	.91	.673	.15	.768
.44	.488	.68	.583	.92	.677	.16	.772
.45	.492	.69	.587	.93	.681	.17	.776
.46	.496	.70	.591	.94	.685	.18	.780

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
78.19	30.784	78.43	30.878	79.67	30.973	78.91	31.067
.20	.788	.44	.882	.68	.977	.92	.071
.21	.792	.45	.886	.69	.981	.93	.075
.22	.795	.46	.890	.70	.984	.94	.079
.23	.799	.47	.894	.71	.988	.95	.083
.24	.803	.48	.898	.72	.992	.96	.087
.25	.807	.49	.902	.73	.996	.97	.091
.26	.811	.50	.906	.74	31.000	.98	.095
.27	.815	.51	.910	.75	.004	.99	.099
.28	.819	.52	.914	.76	.008	79.00	.103
.29	.823	.53	.918	.77	.012	.01	.107
.30	.827	.54	.921	.78	.016	.02	.110
.31	.831	.55	.925	.79	.020	.03	.114
.32	.835	.56	.929	.80	.024	.04	.118
.33	.839	.57	.933	.81	.028	.05	.122
.34	.843	.58	.937	.82	.032	.06	.126
.35	.847	.59	.941	.83	.036	.07	.130
.36	.851	.60	.945	.84	.040	.08	.134
.37	.855	.61	.949	.85	.044	.09	.138
.38	.859	.62	.953	.86	.047	.10	.142
.39	.862	.63	.957	.87	.051	.11	.146
.40	.866	.64	.961	.88	.055	.12	.150
.41	.870	.65	.965	.89	.059	.13	.154
.42	.874	.66	.969	.90	.063	.14	.158

Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.	Centi-mètres.	English inches.
79.15	31.162	79.39	31.256	79.63	31.351	79.87	31.445
.16	.166	.40	.260	.64	.355	.88	.449
.17	.170	.41	.264	.65	.359	.89	.453
.18	.173	.42	.268	.66	.362	.90	.457
.19	.177	.43	.272	.67	.366	.91	.461
.20	.181	.44	.276	.68	.370	.92	.465
.21	.185	.45	.280	.69	.374	.93	.469
.22	.189	.46	.284	.70	.378	.94	.473
.23	.193	.47	.288	.71	.382	.95	.477
.24	.197	.48	.292	.72	.386	.96	.481
.25	.201	.49	.296	.73	.390	.97	.485
.26	.205	.50	.299	.74	.394	.98	.488
.27	.209	.51	.303	.75	.398	.99	.492
.28	.213	.52	.307	.76	.402	80.00	.496
.29	.217	.53	.311	.77	.406	.01	.500
.30	.221	.54	.315	.78	.410	.02	.504
.31	.225	.55	.319	.79	.414	.03	.508
.32	.229	.56	.323	.80	.418	.04	.512
.33	.233	.57	.327	.81	.422	.05	.516
.34	.236	.58	.331	.82	.425	.06	.520
.35	.240	.59	.335	.83	.429	.07	.524
.36	.244	.60	.339	.84	.433	.08	.528
.37	.248	.61	.343	.85	.437	.09	.532
.38	.252	.62	.347	.86	.441	.10	.536

Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.	Centimètres.	English inches.
80.11	31.540	80.21	31.579	80.31	31.618	80.41	31.658
.12	.544	.22	.583	.32	.622	.42	.662
.13	.547	.23	.587	.33	.626	.43	.666
.14	.551	.24	.591	.34	.630	.44	.670
.15	.555	.25	.595	.35	.634	.45	.673
.16	.559	.26	.599	.36	.638	.46	.677
.17	.563	.27	.603	.37	.642	.47	.681
.18	.567	.28	.607	.38	.646	.48	.685
.19	.571	.29	.610	.39	.650	.49	.689
.20	.575	.30	.614	.40	.654	.50	.693

TABLE

FOR REDUCING DEGREES OF THE CENTIGRADE THERMOMETER TO DEGREES OF FAHRENHEIT.

1 *Degree Fahrenheit* = $\frac{5}{9}$ *Degree Centigrade.*

Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
—40.0	—40.0	—30.5	—22.9	—21.0	— 5.8	—11.5	11.3
—39.5	—39.1	—30.0	—22.0	—20.5	— 4.9	—11.0	12.2
—39.0	—38.2	—29.5	—21.1	—20.0	— 4.0	—10.5	13.1
—38.5	—37.3	—29.0	—20.2	—19.5	— 3.1	—10.0	14.0
—38.0	—36.4	—28.5	—19.3	—19.0	— 2.2	— 9.5	14.9
—37.5	—35.5	—28.0	—18.4	—18.5	— 1.3	— 9.0	15.8
—37.0	—34.6	—27.5	—17.5	—18.0	— 0.4	— 8.5	16.7
—36.5	—33.7	—27.0	—16.6	—17.5	0.5	— 8.0	17.6
—36.0	—32.8	—26.5	—15.7	—17.0	1.4	— 7.5	18.5
—35.5	—31.9	—26.0	—14.8	—16.5	2.3	— 7.0	19.4
—35.0	—31.0	—25.5	—13.9	—16.0	3.2	— 6.5	20.3
—34.5	—30.1	—25.0	—13.0	—15.5	4.1	— 6·0	21.2
—34.0	—29.2	—24.5	—12.1	—15.0	5.0	— 5.5	22.1
—33.5	—28.3	—24.0	—11.2	—14.5	5.9	— 5.0	23.0
—33.0	—27.4	—23.5	—10.3	—14.0	6.8	— 4.5	23.9
—32.5	—26.5	—23.0	— 9.4	—13.5	7.7	— 4.0	24.8
—32.0	—25.6	—22.5	— 8.5	—13.0	8.6	— 3.5	25.7
—31.5	—24.7	—22.0	— 7.6	—12.5	9.5	— 3.0	26.6
—31.0	—23.8	—21.5	— 6.7	—12.0	10.4	— 2.5	27.5

Centi-grade.	Fahren-heit.	Centi-grade.	Fahren-heit.	Centi-grade.	Fahren-heit.	Centi grade.	Fahren-heit.
— 2.0	28.4	11.0	51.8	24.0	75.2	37.0	98.6
— 1.5	29.3	11.5	52.7	24.5	76.1	37.5	99.5
— 1.0	30.2	12.0	53.6	25.0	77.0	38.0	100.4
— 0.5	31.1	12.5	54.5	25.5	77.9	38.5	101.3
0.0	32.0	13.0	55.4	26.0	78.8	39.0	102.2
0.5	32.9	13.5	56.3	26.5	79.7	39.5	103.1
1.0	33.8	14.0	57.2	27.0	80.6	40.0	104.0
1.5	34.7	14.5	58.1	27.5	81.5	40.5	104.9
2.0	35.6	15.0	59.0	28.0	82.4	41.0	105.8
2.5	36.5	15.5	59.9	28.5	83.3	41.5	106.7
3.0	37.4	16.0	60.8	29.0	84.2	42.0	107.6
3.5	38.3	16.5	61.7	29.5	85.1	42.5	108.5
4 0	39.2	17.0	62.6	30.0	86.	43.0	109.4
4.5	40.1	17.5	63.5	30.5	86.9	43.5	110.3
5.0	41.0	18.0	64.4	31.0	87.8	44.0	111.2
5.5	41.9	18.5	65.3	31.5	88.7	44.5	112.1
6.0	42.8	19.0	66.2	32.0	89.6	45.0	113.0
6.5	43.7	19.5	67.1	32.5	90.5	45.5	113.9
7.0	44.6	20.0	68.0	33.0	91.4	46.0	114.8
7.5	45.5	20.5	68.9	33.5	92.3	46.5	115.7
8.0	46.4	21.0	69.8	34.0	93.2	47.0	116 6
8.5	47.3	21.5	70.7	34.5	94.1	47.5	117.5
9.0	48.2	22.0	71.6	35.0	95.0	48.0	118.4
9.5	49.1	22.5	72.5	35.5	95.9	48.5	119.3
10.0	50.0	23.0	73.4	36.0	96.8	49.0	120 2
10.5	50 9	23.5	74.3	36.5	97.7	49.5	121.1

[*Form No. 3.*]

METEOROLOGICAL

Station *Lat.* *Long.*

184	Barometer.				Thermometer Attached.			
	Sun rise.	9 A. M.	3 P. M.	9 P. M.	Sun rise.	9 A. M.	3 P. M.	9 P. M.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
Monthly Mean.								

REGISTER.

Alt. of Bar. above *feet.*

Thermometer Detached.					Clearness of the Sky.			
Sun rise.	9 A. M.	3 P. M.	9 P. M.	Daily Mean.	Sun rise.	9 A. M.	3 P. M.	9 P. M.

Wind.				Clouds.				Wet bulb.	
Sun rise.	9 A. M.	3 P. M.	9 P. M.	Sun rise.	9 A. M.	3 P. M.	9 P. M.	Sun rise.	3 P. M.

REGISTER. (CONTINUED.)

Rain.			REMARKS.
Began.	Ended.	Quant'y	

[*Form No.* 4.]

HOURLY METEOROLOGICAL REGISTER.

Station *Lat.* *Long.* *Alt. Bar. above* *feet.*

Date.	Barometer.	Attached Thermom.	Detached Thermom.	Clearness of Sky.	Wind.	Clouds.	Wet-bulb.	REMARKS.
6 A. M.								
7								
8								
9								
10								
11								
12 M.								
1 P. M.								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
1 A. M.								
2								
3								
4								
5								
6								
Mean.								

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